

Coagulation

- Formation of blood clots
- Prothrombin activator
- Prothrombin \Rightarrow thrombin
- Fibrinogen \Rightarrow fibrin
- Clot retraction

Fibrinolysis

- Plasminogen
- Tissue plasminogen activator (tPA)
- Plasmin

Disseminated Intravascular Coagulation

“A systemic thrombohemorrhagic disorder
... with evidence of:

- 1) Procoagulant activation
- 2) Fibrinolytic activation
- 3) Inhibitor consumption
- 4) End-organ failure”

Pathophysiology of DIC

- Uncontrolled acceleration of clotting cascade
- Small vessel occlusion
- Organ necrosis
- Depletion of clotting factors
- Activation of fibrinolysis
- Ultimately severe systematic hemorrhage

Container

- Vasculature is continuous, closed and pressurized system
- Microcirculation responds to local tissue needs
- Blood flow dependent on PVR

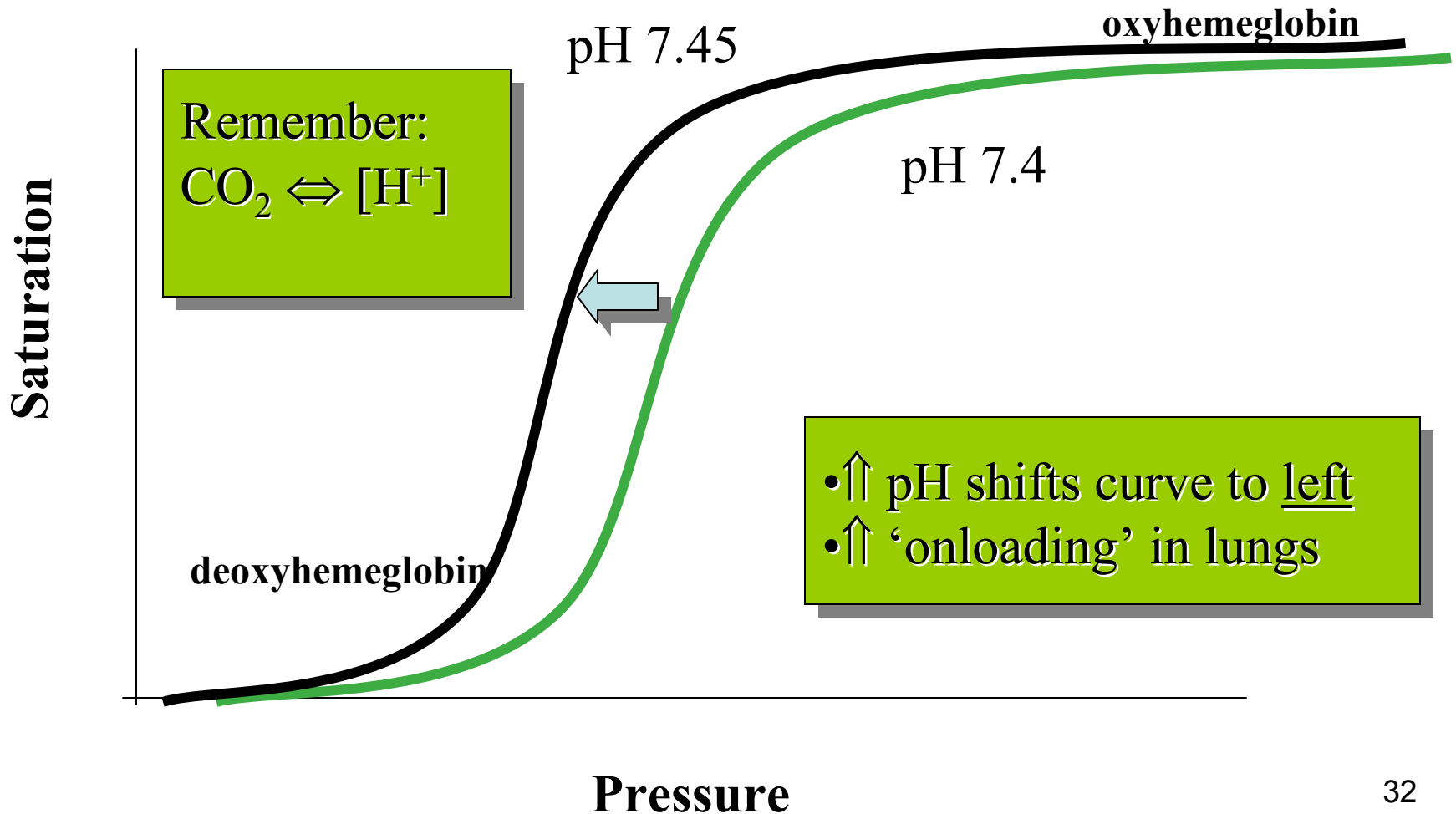
Fick Principle

- Effective movement and utilization of O_2 dependent on:
 - Adequate fio_2
 - Appropriate O_2 diffusion into bloodstream
 - Adequate number of RBCs
 - Proper tissue perfusion
 - Efficient hemoglobin 'loading'

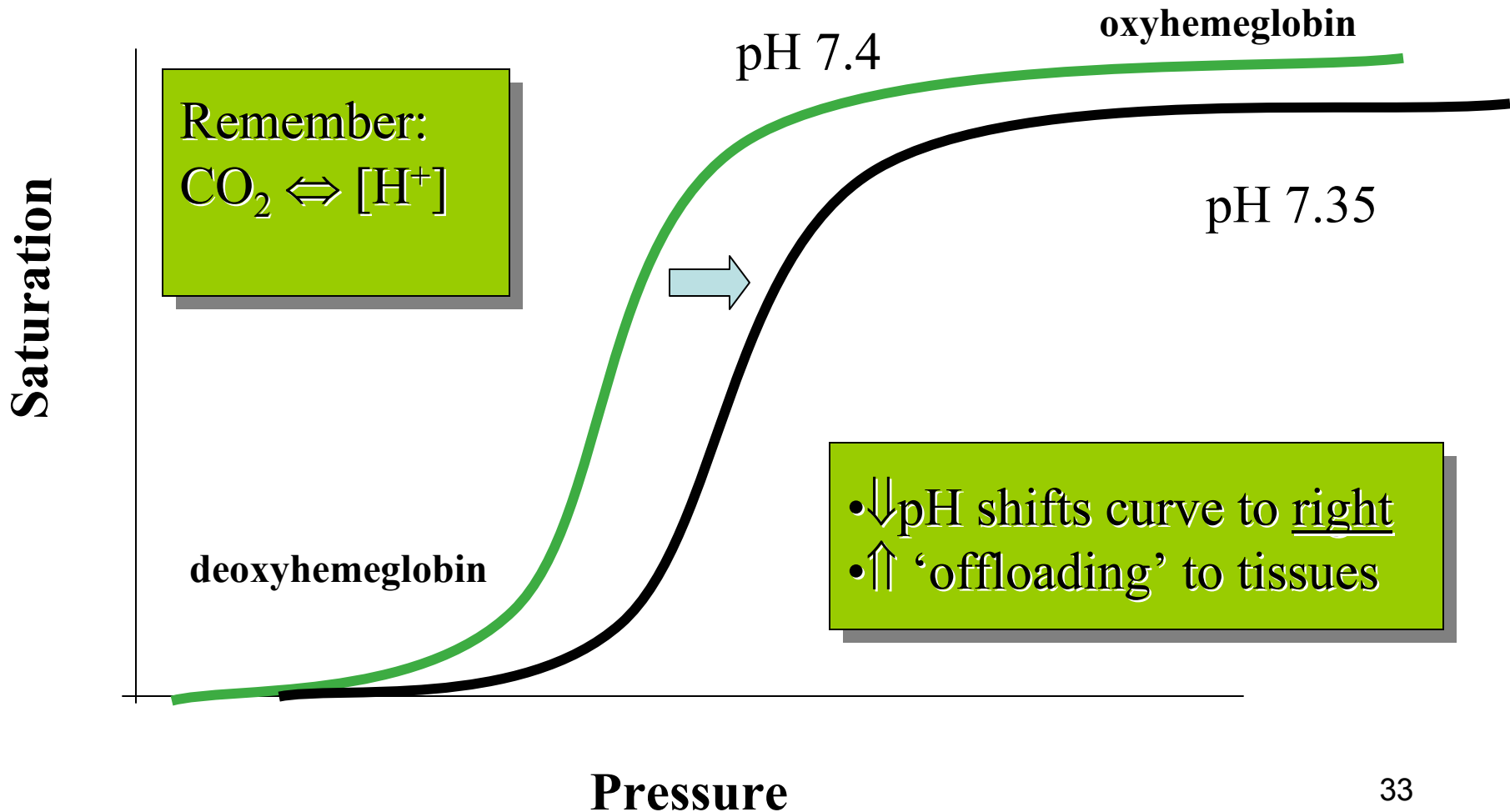
Fick Principle

- Perfusion = Arterial O₂ Content - Venous O₂ Content
- Affected by:
 - Hemoglobin levels
 - circulation of RBCs
 - distance between alveoli and capillaries
 - pH and temperature

Onloading Oxygen in Lungs



Offloading Oxygen in Tissues



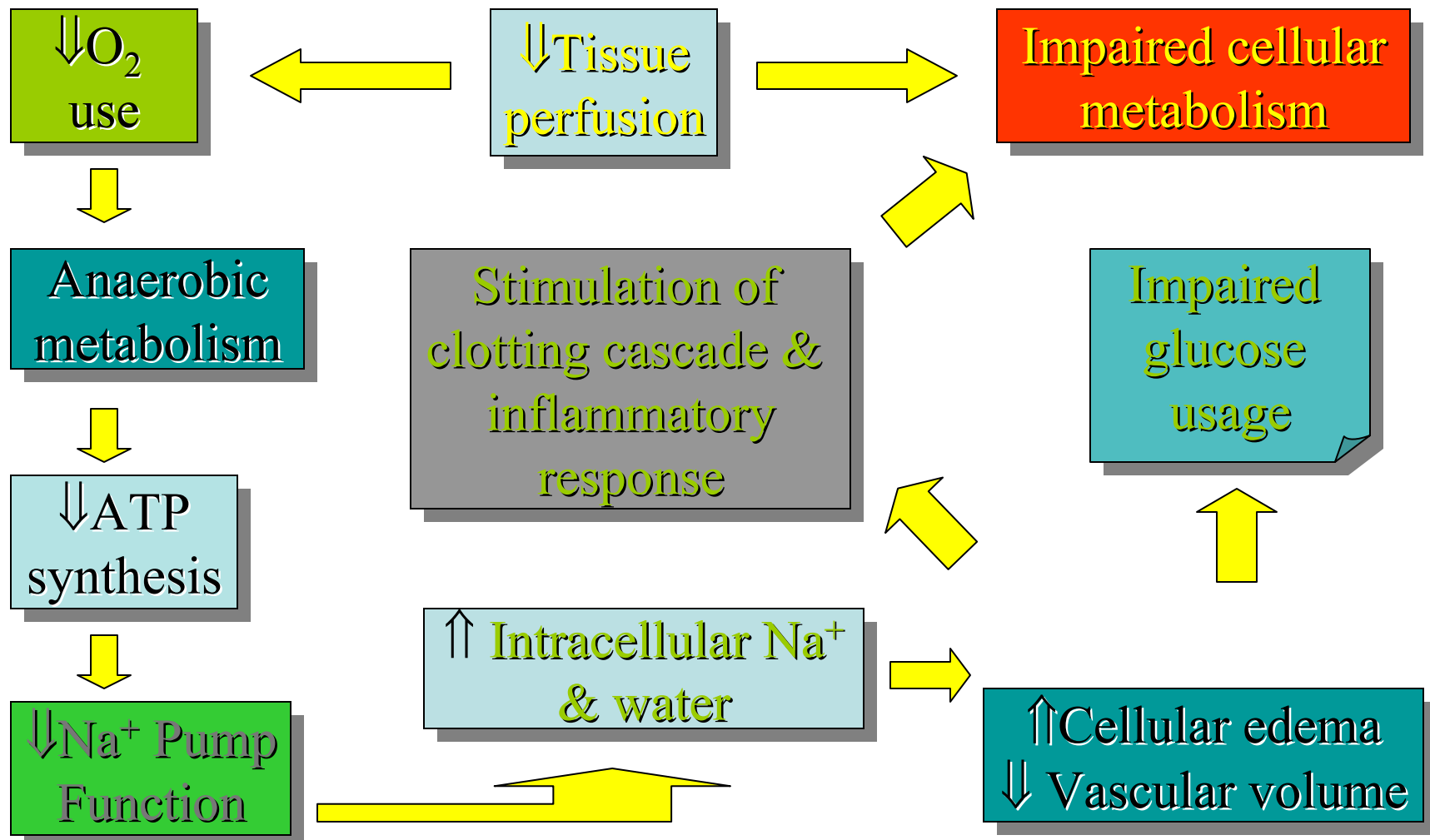
Causes of Inadequate Perfusion

- Inadequate pump
 - Inadequate preload
 - Poor contractility
 - Excessive afterload
 - Inadequate heart rate
- Inadequate fluid volume
 - Hypovolemia
- Inadequate container
 - Excessive dilation
 - Inadequate systematic vascular resistance

Responses to Shock

- Normal compensation includes:
 - Progressive vasoconstriction
 - Increased blood flow to major organs
 - Increased cardiac output
 - Increased respiratory rate and volume
 - Decreased urine output

Cellular Response to Shock



Stages of Shock

- Compensated
- Uncompensated
- Irreversible

Compensated Shock

- Defense mechanisms are successful in maintaining perfusion
- Presentation
 - Tachycardia
 - Decreased skin perfusion
 - Altered mental status

Uncompensated Shock

- Defense mechanisms begin to fail
- Presentation
 - Hypotension
 - Prolonged Cap refill
 - Marked increase in heart rate
 - Rapid, thready pulse
 - Agitation, restlessness, confusion

Irreversible Shock

- Complete failure of compensatory mechanisms
- Death even in presence of resuscitation

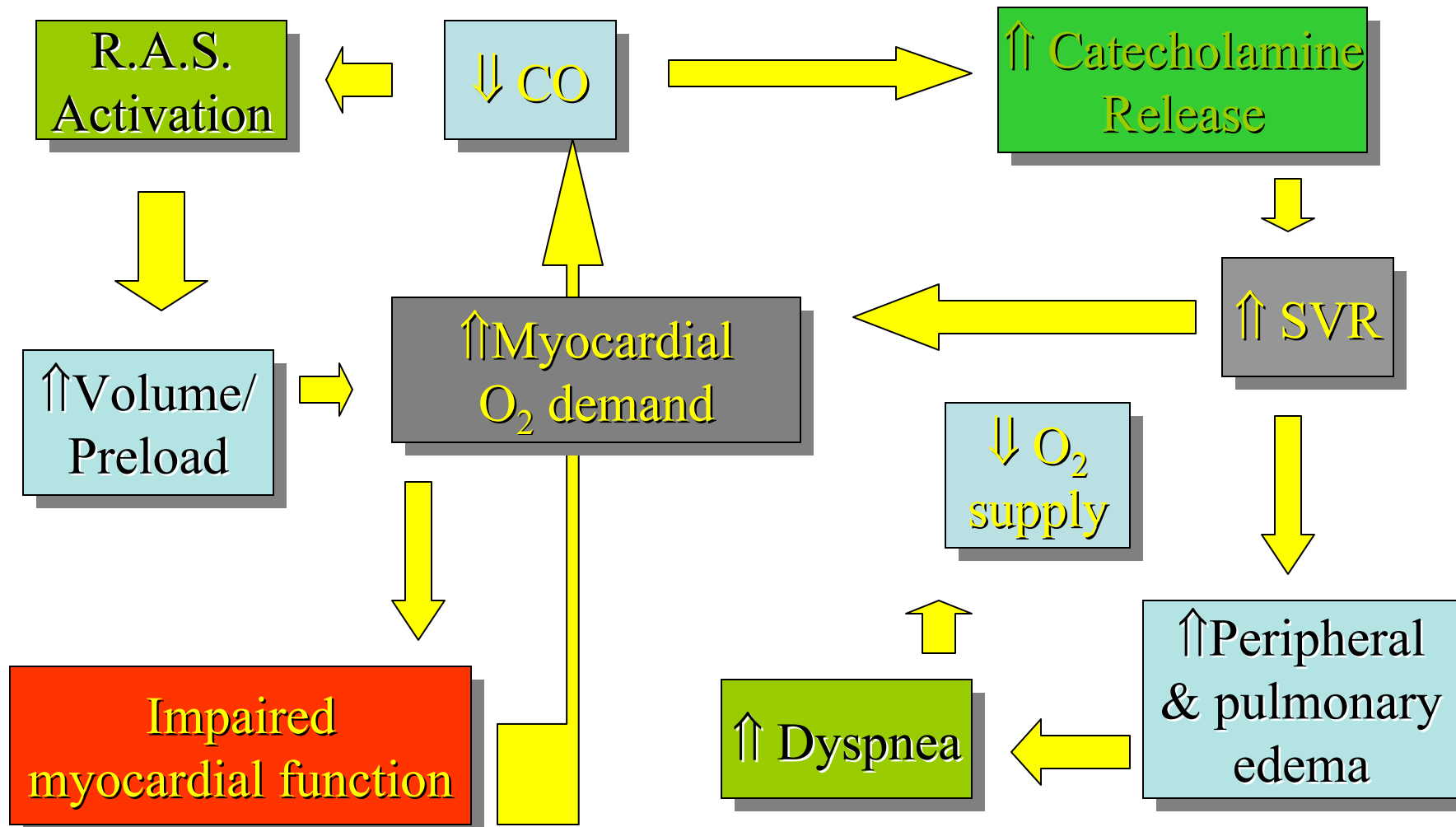
Types of Shock

- Hypovolemic
- Cardiogenic
- Neurogenic
- Anaphylactic
- Septic

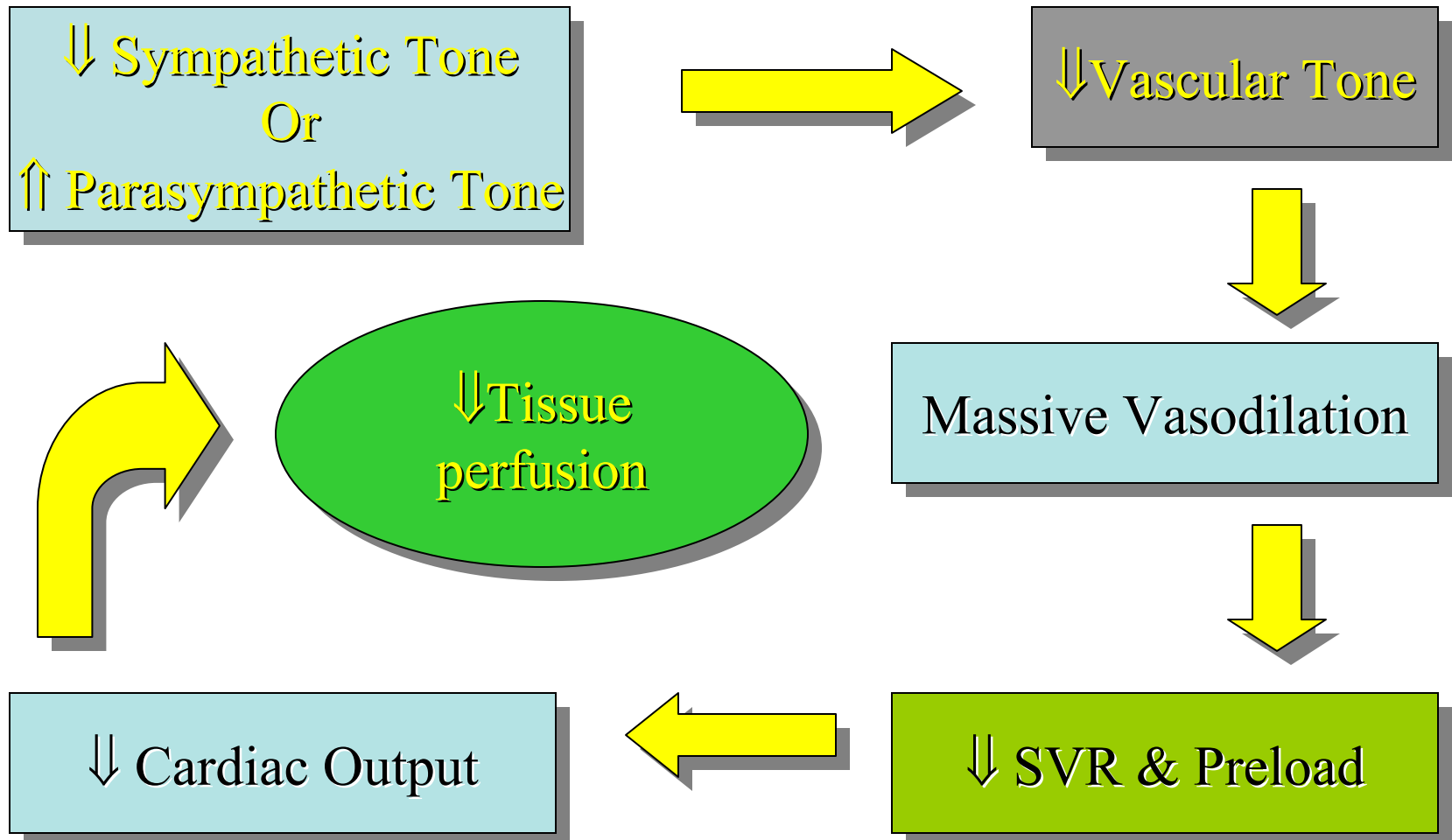
Hypovolemic Shock

- “Fluid failure”
- Decreased intravascular volume
- Causes?
- “Third spacing”

Cardiogenic Shock



Neurogenic Shock



Anaphylactic Shock

- “Container failure”
- Massive & systemic allergic reaction
- Large release of histamine
- Increases membrane permeability & vasodilation

Septic Shock

- “Container failure”
- Systemic infection

Multiple Organ Dysfunction System

- Progressive dysfunction of two or more organ systems
- Caused by uncontrolled inflammatory response to injury or illness
 - Typically sepsis

References

- New York Presbyterian hospital hypertension center:
 - [Http://pc101186.Med.Cornell.edu/htchome/htbk/Htbkindex.htm](http://pc101186.Med.Cornell.edu/htchome/htbk/Htbkindex.htm)
- Biographics Gallery:
<http://www.accessexcellence.com/AB/GG/#Anchor-Building-11481>
- RAS (Renin-Angiotensin-Aldosterone System):
 - <http://www.science.mcmaster.ca/Biology/4S03/RAS.HTM>
- A graduate student's hypertension page:
 - http://www.teaching-biomed.man.ac.uk/student_projects/2000/mnpm6ven/default.htm